Claims

1. A method for electronically capturing and processing image information comprising the steps of:

(a) providing a two-dimensional array of discrete image sensing elements, each discrete element capable of providing an electronic information signal in response to incident illumination, said electronic information signal corresponding to the intensity of said incident illumination, each discrete element being specifically responsive to one of at least three predetermined colors;

(b) obtaining first color image data by exposing the two-dimensional array to image-information bearing illumination such that each discrete element provides said electronic information signal, said first color image data comprising the collection of said electronic information signals;

(c) recovering missing color information along a first dimension by (i) interpolating the first color image data along said first dimension to provide first-interpolated color data, (ii) forming a first difference channel between said first color image data and said first-interpolated color data, (iii) applying a first one-dimensional non-linear filter to said first difference channel, whereby the first-recovered image data is obtained as a combination of the first color image data and the filtered first difference channel, and iv) forming second color data comprising the first color data and the first-recovered color data; and

(d) recovering missing color information along a second dimension by (i) interpolating the second color image data along said second dimension to provide second interpolated color data, (ii) forming a second difference channel between said second color image data and said second interpolated color data, (iii) applying a second one-dimensional non-linear filter to said second difference channel, whereby the second-recovered color data is obtained as a combination of the second color data and the filtered second difference channel, and iv) forming final recovered image data comprising the second color data and the second recovered color data.

2. The method of claim 1, wherein the discrete elements are pattern-wise arranged such that (a) no two discrete elements that are contiguous along said first or second dimension are specifically responsive to the same one of said at least three predetermined colors, and (b) no more than one discrete element is contiguously between two discrete elements that are specifically responsive to the same one of said at least three predetermined colors.

3. The method of claim 2, wherein said first and second one-dimensional non-linear filters are rank-order filters.

4. The method of claim 3, wherein each discrete element is responsive to one of three predetermined colors, the three predetermined colors being a color substantially within the red wavelengths, a color substantially within the green wavelengths, and a color substantially within the blue wavelengths.

5. The method of claim 3, wherein each discrete element is responsive to one of three predetermined colors, the three predetermined colors being a color substantially within a combination the red and green wavelengths, a color substantially within a combination of the green and blue wavelengths, and a color substantially within a combination of the red and blue wavelengths.

6. An electronic imaging apparatus comprising:

a two-dimensional array of discrete image sensing elements for generating first color image data, each discrete element capable of providing an electronic information signal in response to incident illumination, said electronic information signal corresponding to the intensity of said incident illumination, each discrete element being specifically responsive to one of at least three predetermined colors;

a first color recovery module for generating a second color image data from

said first color image data, the first color recovery module having first means for interpolating said first color data along a first dimension to provide first-interpolated color data, first means for non-linear filtering and combining said first-interpolated color data with said first color image data in said first dimension to provide first-recovered color data, and forming second color data comprising said first color data and said first-recovered data; and

a second color recovery for generating a final color-recovered image data from said second color image data, the second color recovery module having second means for interpolating said second color data along a second dimension to provide second interpolated color data, second means for non-linear filtering and combining said second interpolated color data with said second color image data in said second dimension to provide a second-recovered color data, and forming a final recovered image, comprising said second color data and said second-recovered data.

7. The electronic imaging apparatus of claim 6, wherein the discrete elements are pattern-wise arranged such that (a) no two discrete elements that are contiguous along said first or second dimension are specifically responsive to the same one of said at least three predetermined colors, and (b) no more than one discrete element is contiguously between two discrete elements that are specifically responsive to the same one of said at least three predetermined colors.

8. The electronic imaging apparatus of claim 7, wherein said first and second means for non-linear filtering both include rank-order filters.

9. The electronic imaging apparatus of claim 8, wherein each discrete element is responsive to one of three predetermined colors, the three predetermined colors being a color substantially within the red wavelengths, a color substantially within the green wavelengths, and a color substantially within the blue wavelengths.

10. The method of claim 8, wherein each discrete element is responsive to one of three predetermined colors, the three predetermined colors being a color substantially within a combination of the red and green wavelengths, a color substantially within a combination of the green and blue wavelengths, and a color substantially within a combination of the red and blue wavelengths.